



NDRI-PR 72-01

# SUMMARIES OF RESEARCH 1971

NAVAL  
DENTAL RESEARCH  
INSTITUTE

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JAN 1972

NDRI SUMMARIES OF RESEARCH 1971



NAVAL DENTAL RESEARCH INSTITUTE

Great Lakes, Illinois 60088

SUMMARIES OF RESEARCH - 1971

These summaries cover research carried out during  
calendar year 1971.

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Approved and released by

A handwritten signature in dark ink, appearing to read 'H. J. Keene', written in a cursive style.

H. J. KEENE  
COMMANDER, DC, USN  
Commanding Officer



PARTICIPANTS IN RESEARCH CONFERENCES AND SCIENTIFIC SOCIETIES  
DURING CALENDAR YEAR

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HONORS, AWARDS, POSITIONS HELD (outside of NDRI):

Charland, N. L., Lieutenant, MSC, USN, Administrative Officer, officiated as Judge for the Illinois State Junior Academy of Science Fair, University of Illinois, Champaign, Illinois, on 8 May 1971.

Sauk, J. J., Lieutenant Commander, DC, USN, Microbiology Division, was advanced to Fellowship standing in the American Association of Oral Pathologists, May 1971.

Shklair, I. L., PhD, Chief, Microbiology Division, was appointed consultant to the Cystic Fibrosis Project of the American Dental Association.

Shklair, I. L., PhD, appointed consultant to the Immunization Studies Project at Southern Illinois University, Carbondale, Ill.

Shklair, I. L., PhD, appointed consultant to arrange program for Microbiology Section of International Association for Dental Research meeting at Las Vegas, Nevada, to be held in March 1972. (Appointed June.)

Welch, Dennis B., DT2, USNR, was presented with the Navy Achievement Medal for outstanding performance in the area of technical support in design and fabrication of complicated electronic and optical equipment, October 1971.



FORMAL PRESENTATIONS OF RESEARCH MADE AT MEETINGS OF  
SCIENTIFIC SOCIETIES

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FEBRUARY

- Hoerman, K. C. "Phosphorescence of Biological Materials,"  
Biophysical Society, New Orleans, La.

MARCH

- Bognore, R. J. "Automated Dental Health Screening for Clinical Facilities," 49th annual meeting of the International Association for Dental Research, Chicago, Illinois.
- Cotton, W. R. "Microanatomical Observations of Human Dentin", 49th annual meeting of IADR, Chicago, Ill.
- Keene, H. J. "Fluoride History, Fluorosis, Fluoride Concentration of Enamel and Dental Caries," 49th annual meeting of IADR, Chicago, Ill.
- Lamberts, B. L. "A Method of Assessing Enamel Solubility In Vivo," 49th annual meeting of IADR, Chicago, Ill.
- Longton, R. W. "Connective Tissue Response To Stress Associated With Intraperitoneally Injected Amino Acid," 49th annual meeting of IADR, Chicago, Ill.
- Shklair, I. L. "Distribution and Frequency of S. mutans in Caries-active Individuals," 49th annual meeting of IADR, Chicago, Ill.
- Shreve, W. B. "Illness Scores of Patients Exposed to Dental Aerosols," 49th annual meeting of IADR, Chicago, Ill.
- Simonson, L. G. "A Rapid Plate Method for Screening Dextranase-Producing Microorganisms." 49th annual meeting of IADR, Chicago, Ill.

APRIL

- Cotton, W. R. "Scanning Electron Microscopy of Dental Decay," ADA-NDRI, Minnesota Dental Meeting, Minneapolis, Minn.

#### APRIL (continued)

- Hoerman, K. C. "Fluoride in Human Enamel Relative to Prevalence of Dental Caries," American Institute of Nutrition, Chicago, Ill.
- Sauk, J. J. "Symposium of Genetic Dental and Oral Manifestations of Hereditary Disease," American Academy of Oral Pathology, Washington, D. C.

#### MAY

- Keene, H. J. "Periodontal Disease in Caries-Free Naval Recruits," Wisconsin State Dental Association Meeting, Milwaukee, Wisconsin.
- Shklair, I. L. "Illness in Patients Following Exposure to Dental Aerosols," (presented Dr. Shreve's paper), American Society for Microbiology Meeting, Minneapolis, Minnesota. (Dental Aerobiology Section)
- Shreve, W. B. "Illness in Patients Following Exposure to Dental Aerosols," Symposium on Infectious Diseases, American Society of Microbiology, annual meeting, at Minneapolis, Minn.

#### JULY

- Shklair, I. L. "Streptococci mutans and Caries Activity," Microbiology Department, Southern Illinois University, Carbondale, Illinois.

#### OCTOBER

- Burmeister, J. A. "Pulpal Responses to Bacterial Invasion," Greater Cotton, W. R. Milwaukee Dental Association Meeting, Milwaukee, Wisconsin. Included Table Display and Testing of Visitors for S. mutans, televised on local station.

#### DECEMBER

- Keene, H. J. "Caries Immunity in Naval Recruits and Ancient Hawaiians," Symposium on Comparative Immunology of the Oral Cavity, American Association for the Advancement of Science, Philadelphia, Pa.



## RESEARCH RESULTS REPORTED AND/OR DISCUSSIONS LED

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### JANUARY

Counsell, L. A. "Dental Health Education Research Studies at NDRI," School of Public Health, University of Michigan, Ann Arbor, Michigan.

All Principal Investigators: Presented briefing of research results and plans to Commanding Officer, Recruit Training Command, Naval Training Center, Naval Base, Great Lakes, Illinois. Discussions were held in connection with recruit participation in research programs.

### APRIL

Shreve, W. B. "An Advanced Hardware Development Program; The Naval Dental Van," at NAMRU #4, Great Lakes, Illinois

### MAY

Bognore, R. J. "Small Computer Application in Dental Health Care Delivery Systems and Computer Generated Health Records," at NAMRU #4, Great Lakes, Illinois.

Cotton, W. R. "Scanning Electron Microscopy of Tooth Structure and Dental Decay," to research group at Loyola University, Chicago, Illinois.

Hoerman, K. C. "Dental Disease Control," Naval Dental School, National Naval Medical Center, Bethesda, Md.

### JUNE

Cotton, W. R. "Response of the Dental Pulp Challenged with Streptococcus mutans," at NAMRU #4, Great Lakes, Ill.

Meyer, T. S. "Mechanism of Virus Replication," Chicago Medical School, Chicago, Illinois.

All Principal Investigators: Presented briefing of research results and plans to the National Research Council, from Washington, D. C. Discussion of future research in the field of dentistry was held.

### JULY

Burmeister, J. A. Histopathology Conference, School of Dental Medicine, and Cotton, W. R. University of Connecticut, Farmington, Connecticut.

#### continued JULY

- Lamberts, B. L. "In Vivo Measurement of Tooth Enamel Solubility," at NAMRU #4, Great Lakes, Illinois.
- Meyer, T. S. "Research at the Naval Dental Research Institute," at University of Wurzburg, Wurzburg, Germany.
- Shreve, W. B. "Prototype Field Dental Van Research," Naval Air Systems Command, Norfolk, Virginia.

Entire Staff of principal investigators reported research results and discussion was held with Dr. Allene Jeanes, Principal Chemist, Cereal Properties Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Peoria, Illinois.

#### AUGUST

- Shklair, I. L. "Effect of Full Mouth Rehabilitation on Cariogenic Streptococcus mutans," at NAMRU #4, Great Lakes, Illinois.

#### SEPTEMBER

- Meyer, T. S. "Gas Chromatography and its Possible Application To Dental Research," at NAMRU #4, Great Lakes, Illinois.

#### OCTOBER

- Kueter, K. "Ecology and Toxicology of Fluoride," at NAMRU #4, Great Lakes, Illinois.

#### NOVEMBER

- Coykendall, A. L. "Genetic Heterogeneity in Cariogenic Streptococcus mutans," at NAMRU #4, Great Lakes, Illinois.
- Coykendall, A. L. "Genetic Heterogeneity in Streptococcus mutans," Dental Research Institute, University of Michigan, Ann Arbor, Michigan.
- Keene, H. J. "Prevalence of S. mutans in Naval Personnel," at National Institute for Dental Research, Bethesda, Md.
- Meyer, T. S. "Nitrogen and Fixation," Chicago Medical School, Chicago, Illinois.

## PARTICIPATION IN OTHER PROGRAMS

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### FEBRUARY

Sharrow, B. E. Chicago Midwinter Meeting of Chicago Dental Society, Chicago, Illinois.

Shreve, W. B. Commanding Officers Management Conference, at Naval Medical Research Institute, Bethesda, Md.

### MARCH

Shreve, W. B. Dental Van Conference, Naval Air Systems Command, Norfolk, Va.

### APRIL

Charland, N. L., "Recognition of Military Personnel for Service or Achievement," NDRI, Great Lakes, Illinois.

Medical Service Corps monthly meeting host, providing speaker, Dr. Morley Kare, University of Pennsylvania.

\* Counsell, L. A. Represented NDRI at 22nd National Dental Health Conference at ADA Headquarters, Chicago, Ill.

Hoerman, K. A. Navy Representative at National Institutes of Health Conference on "Expanded Use of Dental Auxilliaries and Task Analysis," Washington, D. C.

Keene, H. J. Annual meeting of American Association of Physical Anthropologists, Boston, Mass.

Sauk, J. J. American Academy on Oral Pathology Conference, Washington, D. C.

Sharrow, B. E. Demonstration Officer for DUX-1 aboard USS Saginaw (LST-1188) during Medical Unit, Self-Contained Transportable (M.U.S.T.) testing.

### MAY

Shklair, I. L. "Streptococci and Their Diseases - Recognition, Understanding, and Management," University of Minnesota.

Simonson, L. L. 71st Annual Meeting of American Society for Microbiology, Minneapolis, Minn.

## PARTICIPATION IN OTHER PROGRAMS (continued)

### JUNE

- Lamberts, B. L. Biochemistry Division of Federation of American Societies for Experimental Biology meeting, San Francisco, California.
- Burmeister, J. Appointed consultant to Great Lakes Ecology Association for Military, Great Lakes, Illinois.
- Counsell, L. A. 1971 Pedodontic Seminar at American Society of Dentistry for Children, American Dental Association, Chicago, Illinois.

### JULY

- Meyer, T. S. Attended two week session at the University of Wurzburg, Wurzburg, Germany.

### SEPTEMBER

- Coykendall, A. L. Attended 4th International Conference of Oral Biology at Zurich, Switzerland.

### OCTOBER

- Counsell, L. A. Public Association Meeting, Minneapolis, Minnesota.
- Cotton, W. R. Leitz Lecture Series in Microscopy and Photography, University of Illinois, Champaign, Illinois.
- Kueter, K. Attended 7th Annual Symposium on Histopathology Technique, Armed Forces Institute of Pathology, Washington, D. C.

All principal investigators participated in an Officers' Call/Retreat at Alpine Valley, Wisconsin, setting a precedent at Naval Dental Research Institute. Research results were reported and discussed with guest consultants, Captain G. H. Rovelstad, Bureau of Medicine and Surgery, Washington, D. C.; Captain C. Ostrom, ADCOM, Dental Division, Great Lakes, Illinois; CDR J. Klima, ADCOM, Dental Division, GLakes; Dr. Robert Fitzgerald, Chief, Dental Research Unit, Veterans' Hospital, Miami, Florida; Professor A. Russell, School of Public Health, University of Michigan, Ann Arbor, Michigan; and Dr. Ronald J. Gibbons, Head, Department of Oral Biology, Forsyth Dental Center, Boston, Massachusetts.



PARTICIPATION IN OTHER PROGRAMS (continued)

NOVEMBER

Lamberts, B. L. Northern Regional Research Laboratory, U. S.  
Department of Agriculture, Peoria, Illinois.

Shreve, W. B. Senior Line Management Seminar,  
Rosslyn, Virginia.

DECEMBER

Cotton, W. R. Ninth Naval District Race Relations Seminar,  
Great Lakes, Illinois

Counsell, L. A. Greater New York Dental Meeting, New York.

Coykendall, A. L. University of Connecticut Health Center and  
Dental Research Laboratory of Veterans Administra-  
tion Hospital, Newington, Conn.

Edman, D. C. American Association for Advancement of Science

Shklair, I. L. Annual Meeting and Symposium on Comparative Immunology  
of the Oral Cavity, Philadelphia, Pa.

MISCELLANEOUS ACTIVITIES OF STAFF

Charland, N. L.      Appointed to Citizens' Advisory Council for the Board of Education, North Chicago, Community High School, North Chicago, Illinois.

Edman, D. C.        Appointed as NDRI representative to the Jr. Advisory Board of COM (Open).

Charland, N. L.      Presented a 7-1/2 hour course over a 3 day period on "Administering a Church Training Program" to members of the Hillcrest Baptist Church in North Chicago.

Counsell, L. A.      Appointed Chairman of Combined Federal Campaign 1971.

The Naval Dental Research Institute hosted the April, 1971, Chicago Section of the International Association for Dental Research Meeting at Great Lakes, holding Open House during the day at the Institute, and dinner meeting in the evening at the Commissioned Officers Club with guest speaker, Dr. M. Kare, Director of Monel Chemical Senses Center at the University of Pennsylvania.

NAVAL DENTAL RESEARCH INSTITUTE  
GREAT LAKES, ILLINOIS 60088

CURRENT WORK UNITS - 1971

CATEGORY 1. RESEARCH

Defense Research Sciences

Research Project MR041.20 - Clinical Medical Sciences

MR041.20.02 6041A3IJ - Histopathology of Dental Pulp Associated with  
Deep Dental Caries of Naval Recruits

MR041.20.02 6048B3IJ - Biochemistry of Infection-Free and Pathological  
Oral Environments in Naval Recruits

MR041.20.02 6049A3IJ - Studies of Microorganisms Involved in Oral  
Diseases of Naval Personnel

MR041.20.02 6055B3IJ - Studies in Dental Health Education in a Naval  
Setting

• MR041.20.02 0317B3IA - Interpersonal Communications in the Dental  
Operatory

In-House Laboratory

Research Project MR011.01.01 - Navy Laboratories

MR011.01.01 0001 - Measurement of Small Effect Phenomena in  
Biological Systems

MR011.01.01 0003 - Dental Officers as Carriers of Meningococci

MR0011.01.01 0005 - Evaluation of a Reciprocating Surgical Saw

MR0011.01.01 0006 - Development of an Enamel Biopsy Handpiece

## CATEGORY 2. EXPLORATORY DEVELOPMENT

### Life Sciences

#### Research Project MF12.524.009 - Disease Prevention and Control

MF12.524.009 - 0013AG31 - Physical Measurements for Monitoring Health of Naval Personnel

#### Research Project MF12.524.012 - Dental Technology

MF12.524.012 0001BG3I - Chemical Factors and Nutrition in Resistance to Infections of Oral Structures

MF12.524.012 0002BG3I - Bacteriology of the Oral Environment in Caries-Free Naval Recruits

MF12.524.012 0004AG3I - Prevention of Dental Caries in Naval Personnel

MF12.524.012 0005BG3I - Dental Instruments Sterilization in Navy Dental Clinics

MF12.524.012 0006AG3I - Oral Health of Naval Personnel

MF12.524.012 0011BG3I - Collagen Studies in Relation to Periodontal Disease in Naval Personnel

MF12.524.012 0012BG3I - Biophysical Nature of Microbial Infectious Agents Causing Dental Caries

## CATEGORY 3. ADVANCED DEVELOPMENT

### Advanced Medical Development

#### Research Project M4305.04 - Dental Equipment

M4305.04 3005AG13 - Digigraphic Methods of Recording of Military Dental Health Recodr (SF-603)

#### Research Project M4305.05 - Advanced Development in Navy Medical and Surgical Support

4305.05 3059AGG2 - Effect of White Blood Cells at Wound Sites

#### Research Project M4311.02 - Field Dental Equipment

M4311.01 1001AGF8 - Mobile Field and Combat Dental Support for Marine Corps and Navy Task Forces



RESEARCH PROGRESS REPORTS - 1971

- NDRI PR-71-01 - BENEFICIAL COMMUNICATIONS FROM DENTISTS TO PATIENTS  
R. G. Pishel, Jr.
- NDRI PR-71-02 - SCANNING ELECTRON MICROSCOPY OF THE ANTIGEN-ANTIBODY  
COMPLEX  
L. G. Simonson, I. L. Shklair
- NDRI PR-71-03 - FLUORIDE AVAILABILITY AND THE PREVALENCE OF CARIES-FREE  
NAVAL RECRUITS: A PRELIMINARY TEN YEAR REPORT  
H. J. Keene, G. H. Rovelstad, S. Hoffman and  
W. R. Shiller
- NDRI PR-71-04 - A COMPARATIVE STUDY OF HUMAN PAROTID AND SUBMAXILLARY  
AMYLASE  
B. H. Lamberts, T. S. Meyer, and R. M. Osborne
- NDRI PR-71-05 - SUMMARIES OF RESEARCH - 1970
- NDRI PR-71-06 - PRELIMINARY AUTOMATED DENTAL HEALTH INTERVIEWING  
R. J. Bognore, K. C. Hoerman, H. J. Mayhew
- NDRI PR-71-07 - EPIDEMIOLOGY STUDY OF TOOTH SIZE VARIABILITY IN  
CARIES-FREE RECRUITS  
H. J. Keene
- NDRI PR-71-08 - ULTRAVIOLET LIGHT INDUCED FLUORESCENCE AND PHOSPHORESCENCE  
OF BACTERIA AT 90° KELVIN  
K. C. Hoerman
- NDRI PR-71-09 - RAPID IMPROVED AMINO ACID ANALYSIS OF COLLAGEN  
R. M. Osborne, R. W. Longton, and B. L. Lamberts

OTHER PUBLICATIONS

- Bognore, R. J. "My Computer is a Dentist," press release from IADR, 14 March 1971.
- Cotton, W. R. and Leonard, E. P. "Dentine in Viva Impermeability to Radioactivity Labeled Prednisolone," Oral Surgery, Oral Medicine and Oral Pathology, 31:104-112, Jan., 1971.
- Cotton, W. R. "Pulpal Response to Cavity Drying," Journal of Dentistry for Children, Mar-Apr., Vol. 28: No. 2, pp 21-28.
- Counsell, L. A. "The Effect of Routine Antibiotic Prophylaxis on the Periodontal Health and Oral Hygiene of Young Male Adults," J. Dent. Res, Sept 1, 1971.
- Coykendall, A. and Daily, O. P, Kramer, M. J. and Beath, M. E. "DNA-DNA Hybridization Studies of Streptococcus mutans," published in J. Dent. Res. 50:1131-1139, 1971.
- Keene, H. J. "Fluoride Availability and the Prevalence of Caries-Free Naval Recruit - A Preliminary 10 Year Report," Archives of Oral Biology, Vol. 16, Mar 71.
- Keene, H. J. "An Epidemiologic Study of Tooth Size Variability in Caries-Free Naval Recruits," Journal of Dental Research, Vol 50:1331-1345, Sept-Oct 1971.
- Lamberts, B. L. "A Comparative Study of Human Parotid and Submaxillary Amylase," with T. S. Meyer, and R. M. Osborne, Archives of Oral Biology, 16:517 (May) 1971.
- Lamberts, B. L. "Rapid Improved Amino Acid Analysis of Collagen," Analytical Biochemistry, Vol 44, Number 1, Nov. 1971.
- Meyer, T. S. (coauthor) "Localization and Specificity of Binding of Serotonin in the Central Nervous System," Science 171:809-812, 1971.
- Meyer, T. S., Lamberts, B. L. and Osborne, R. M. "A Comparative Study of Human Parotid and Submaxillary Amylase," Archives of Oral Biology 16:517-526, 1971.
- Shreve, W. B. "Mobile Dental Facility for Amphibious Support," U. S. Navy Medicine, Nov. 1971.

D I S T I N G U I S H E D   V I S I T O R S

1971

JANUARY

Dr. Kaare Langeland, University of Connecticut

Dr. Lloyd F. Miller, Bureau of Medicine and Surgery (Code 71)

Mr. Albert J. Futsch, Center for Responsive Law, Washington, D. C.

Dr. Arthur N. Bahn, Southern Illinois University

Dr. James A. Hayashi, Rush-Presbyterian-St. Luke's Hospital, Chicago.

FEBRUARY

Dr. M. Massler, University of Illinois, Chicago, Illinois.

James T. Ogivek, Loyola University, Maywood, Illinois

P. W. Goay, Loyola University, Maywood, Illinois

L. P. McElwaine, Naval Res. Association, Tulsa, Oklahoma.

R. G. Beckelheimer, U. S. Army, Fort Sam Houston, Texas

Edwin Frederick, Atomic Disposal, Midlothian, Ill.

Captain F. M. Symons, USN, Commanding Officer, Recruit Training  
Command, Great Lakes, Illinois

Commander L. A. Hamilton, USN, Recruit Training Command, Great Lakes, Ill.

Dr. P. Soprey, Northwestern University

MARCH

Group of students from University of Illinois visited NDRI and ADCOM Dental.

Dr. G. J. Weir, Jr., Naval Hospital, Great Lakes.

Dr. Carl E. Moore, Loyola University, Chicago, Ill.

Dr. A. K. Jameson, Loyola University, Chicago, Ill.

MARCH (continued)

Gilbert Stanton, New York University, New York

Dr. Harold R. Stanley, University of Florida, Gainesville, Fla.

Aram Y. Balekjian, Naval Medical Research Institute, Bethesda, Md.

Captain M. Mazzearella, SubMed Res Lab, New London, Connecticut

Howard R. Manning, GAO, Chicago, Illinois

APRIL

Dr. P. D. Toto, Loyola University, Chicago, Illinois

Mizuaho Nishina, University of Illinois, Chicago, Illinois

John Pawlak, University of Illinois, Chicago, Illinois

MAY

A. L. Russell, University of Michigan, Ann Arbor, Michigan

\* Cdr. E. L. Lobpreis, Bureau of Medicine and Surgery (Code 7121)

Leonard M. Kempf, Bureau of Medicine and Surgery (Code 733)

JUNE

John Seal, National Research Counsel, Washington, D. C.

Charles Cox, National Research Counsel, Washington, D. C.

Dr. Harvey Lyon, American Dental Association, Chicago, Illinois

C. E. Brodine, Naval Medical Research Institute, Bethesda, Maryland

Dr. Neylan A. Vedros, University of California, Berkeley, California

Capt. Thomas A. Akers, NBRL, Oakland, California

Dr. O. E. Larje, Karolinska Institute, Sweden

Radm. J. P. Arthur, Bureau of Medicine and Surgery (Code 61-T)

Lcdr. J. Kehoe, Jr. Bureau of Medicine and Surgery

Lcdr. P. Ray, Bureau of Medicine and Surgery (Code 61-A)

Lcdr. R. C. Turhune, Naval Dental Graduate School, Bethesda, Maryland



#### JUNE (continued)

Mr. James R. Mellberg, Kendall Research Center, Barrington, Illinois

Mr. Ralph Parsons, Nottingham University, Nottingham, England

Dr. Gareth B. Evans, Nottingham University, Nottingham, England

Group of Dental Students visiting from Great Lakes Naval Hospital

#### JULY

Mr. Charles Burgess, Q. E. I. Incorporated, Burlington, Massachusetts

Dr. Allene Jeanes, U.S.D.A., Peoria, Illinois

Capt. Gordon Rovelstad, Bureau of Medicine and Surgery (Code 614)

#### AUGUST

Loren Hueter, Atomic Energy Commission, Glen Ellyn, Illinois

Glenn Beal, Glenn Beal Engineering Company, Gurnee, Illinois

#### SEPTEMBER

Dr. F. A. Catalanotto, Harvard University, Boston, Massachusetts

Richard Miller, ONR, Chicago, Illinois

Dr. H. R. Englander, NCDR, Bethesda, Maryland

Dr. K. Langeland, University of Connecticut, Farmington, Connecticut

#### OCTOBER

E. W. Gardner, National Institute of Health, Bethesda, Maryland

R. B. Cundall, University of Nottingham, Nottingham, England

#### DECEMBER

J. W. Redman, Loyola Dental School, Maywood, Illinois

H. L. Mermall, Loyola Dental School, Maywood, Illinois

Jason Tanzer, V. A., Newington, Connecticut

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS DURING FY72

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### Biochemistry Division

A chemically-defined culture medium was developed and employed to facilitate the purification of extracellular proteins elaborated by cariogenic microorganisms. Enzymes capable of synthesizing polysaccharides from sucrose are being isolated from different strains of cariogenic streptococci and their properties are being investigated.

Culture-soluble and culture-insoluble dextran fractions were prepared from cultures of eight strains of S. mutans and two strains of S. sanguis. Observations of turbidity of the culture-soluble fractions, along with preliminary light-scattering data, indicated these dextrans were of very high molecular weight. Dextranucrase isolated from cultures of S. mutans SL-1, produced dextrans similar to the soluble and insoluble fractions that could be isolated from cultures of the SL-1 organism. The addition of calcium to the culture medium prior to dextranucrase isolation affected the quantity and appearance of the dextran fractions.

A method of assessing tooth enamel solubility in vivo was developed. Some factors found to affect the practical application of this procedure were tooth size, tooth shape, and tooth surface debris. No relationship of enamel solubility to caries experience could be demonstrated.

### Histopathology Division

Iatrogenic bacterial infection may be a significant cause of pulp capping failures, since pulpal inflammation, infection, and delayed healing were observed more frequently when rat pulps were mechanically exposed through carious lesions produced by Streptococcus mutans. Inflammation, infection and delayed healing were not observed as frequently when the exposure was made through a non-carious surface. These observations were made in a study showing that parenteral penicillin (300,000 units IP) did not prevent pulpal infection in rats even though a therapeutic blood level was maintained for 96 hours.

In a study of the carious attack on dentin, the peritubular dentin, the first area of dentinal attack, was equally susceptible to chelation and acid decalcification. Electron probe microanalysis indicated that the peritubular dentin was hypermineralized compared to intertubular dentin, even though there was considerable variability. The peritubular dentin has definitive concentric patterns, interpreted as crystalline orientation, which may account for its greater density.

## Microbiology Division

Streptococcus mutans has been implicated as the primary infectious agent in dental decay. The organism has been found in great numbers in carious lesions. S. mutans was isolated from the dental plaque of over 90% of individuals with caries, whereas the organism was found on the teeth of only 56% of naval recruits who had no history of dental caries experience. In both groups the interproximal and occlusal surfaces produced the greatest isolation frequency and prevalence of S. mutans, whereas buccal-lingual plaque, (despite its abundance and ease of collection), produced the lowest percentage of S. mutans isolated. This distribution phenomenon has not been demonstrated previously. It could indicate that when S. mutans is present on normal tooth surfaces, caries could develop on these sites.

The implantation of S. mutans in human volunteers has usually not been successful. A technique was developed that allowed for the implantation of patients with their own streptomycin tagged organism. This was done by placing the organism on waxed dental floss and working the floss with organism into interproximal spaces on one side of the mouth. The organism established itself at the implanted site very readily and had a tendency to stay at the implanted sites. The labeled S. mutans were rarely recovered on the side of the mouth not implanted. This study opens new areas of investigation for determining how these cariogenic organisms are transmitted, how they spread in the mouth and eventually how they might be controlled.

Dental decay is a bacterial disease, and Streptococcus mutans may be the single most important causative organism. The suppression or control of the causative organisms would, therefore, result in control of the disease. It was found that S. mutans is inhibited by high concentration of Fluoride ion, ( >10,000 ppm) even when maintained for a short period of time (5 minutes). Therefore, high concentrations of fluoride may be therapeutic as a short term inhibitory agent in addition to reducing enamel solubility and bacterial acid production.

## Epidemiology Division

Carious lesions were found to have a high prevalence of Streptococcus mutans, an organism thought to be the prime etiologic organism in dental caries. When carious lesions were restored by routine operative dentistry procedures, a sharp drop in the isolation frequency and prevalence of these organisms occurred. The study showed that operative dentistry is an effective but incomplete method of eliminating S. mutans from the oral cavity



Calendar year 1971 showed a marked increase in the prevalence of caries-free recruits at Great Lakes, jumping from an average of 2.5 men per thousand seen during the previous 10 year period to a new high of 9.1 men per thousand. The increase was attributed to the nation's fluoridation program which started approximately 20 years ago.

### Biophysics Division

A preliminary automated dental screening interview (PADSI) was expanded and completed. The program, run on a PDP-12A computer consisted of a dialogue between patient and computer which resulted in permanent storage on magnetic tape and a hard copy print-out of the patients medical and dental history. Patient and doctor reaction was favorable about the man-machine interface.

The ONR Nottingham Spectrophosphorimeter was fully assembled, set, calibrated, and configured with computer control and a cryogenic system. The instrument successfully has operated in the identification of low temperature luminescence phenomena.

The atomic absorption photometer and fluoride specific ion electrodes have been assembled for the enamel biopsy studies of fluoride in human enamel. The two primary instruments are working in a manual mode and computer programs have been written which will both operate the instruments and print out their results.

### Clinical Investigations Division

The MMF Avionics van was configured as an experimental dental health care delivery system and was successfully tested as to operational feasibility, transportability by land, sea and air, and compatibility with a MUST system.

Retrospective and "real-time" studies have been completed with results that do not demonstrate dental aerosols as a health hazard in dissemination of acute respiratory infection among naval recruits.

The effect of a mass, routine chemotherapeutic/antibiotic regimen upon the oral hygiene and periodontal health of navy recruits during basic training was evaluated. Results of this study indicated that there was no significant differences between the experimental and control groups as a consequence of the assumed causal variable.

Three conventional modes of health education were evaluated as to their effectiveness as agents of influencing oral hygiene status and knowledge gain in a recruit population. All experimental groups showed trends toward



improvement in knowledge levels. The group using programmed instruction showed the most improvement in information gain, but, paradoxically showed the least change in behavior in terms of changes in dental health habits.



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14.

KEY WORDS

LINK A

LINK B

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Research, summaries of







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